

TABLE 3.—Late reports (instrumental).

Date.	Char-acter.	Phase.	Time.	Pe-riod. T.	Amplitude.		Dis-tance.	Remarks.
					A _m	A _n		

Hawaii. Honolulu. Magnetic Observatory. U. S. Coast and Geodetic Survey. Frank Neuman.

Lat., 21° 19' 12" N.; long., 158° 03' 48" W. Elevation, 15.2 meters.

Instrument: Milne seismograph of the Seismological Committee of the British Association.

Instrumental constant.. $\frac{T_0}{T_0}$ 13.5

1917.			H. m. s.	Sec.	μ	μ	km.
Oct. 6	eP	13 02 00	19				
	eL	13 06 24					
	M	13 07 00					
	C	13 09 00					
	F	13 30 00					
7	eP	15 21 54	26				
	eL	15 49 00					
	M	15 57 12	18				
	C	16 02 00					
	F	16 09 00					
14	eP	3 26 00	20				
	eL	3 38 54					
	M	3 43 54	19				
	C	3 49 00					
	F	3 58 00					
17	eL	15 09 36	26				
	M	15 18 42	18				
	C	15 24 00					
	F	15 37 00					
22	eP	7 42 06	20				
	eL	7 59 00					
	M	8 01 12	18				
	C	8 03 00					
	F	8 43 00					
23	eP	1 21 06	18				
	L	1 24 00					
	M	1 24 30	18				
	C	1 33 00					
	F	1 49 00					
24	e	3 03 06	17				
	M	3 04 54					
	F	3 07 00					
25	eP	20 06 00	18				
	eL	20 15 18					
	M	20 24 18	19				
	C	20 27 00					
	F	20 51 00					
27	e	6 55 12	21				
	M	7 00 00	19				
	C	7 03 00					
	F	7 21 00					
28	eL	13 57 36	23				
	M	14 02 24	18				
	C	14 05 00					
	F	14 35 00					
31	eP	2 27 00	20				
	eL	2 35 00					
	M	2 39 42	19				
	C	2 44 00					
	F	2 57 00					

*Trace amplitude.

New York. Ithaca. Cornell University. Heinrich Ries.

Lat., 42° 28' 58" N.; long. 76° 29' 09" W. Elevation, 242 meters.

Instruments: Two Bosch-Omori, 25 kg., horizontal pendulums (mechanical registration)

Instrumental constants.. $\frac{V}{E} \frac{T_0}{N} \frac{a}{1}$ 13 22 4:1

1917.			H. m. s.	Sec.	μ	μ	km.
Oct. 19	eLN	16 53 45					
	FN	17 16 ..					
22	eLN	7 42 08	22				
	FN	8 10 ..					

SEISMOLOGICAL DISPATCHES.¹

Portland, Oreg. Nov. 16, 1917.

Mount Rainier has been shaken twice this week by earthquakes, according to Prof. John Plett, who has been in the Government service at Rainier National Park for many years. He declares rocks have come hurtling down the mountain side, and his office severely shaken. (Associated Press).

Melbourne, Australia, Nov. 18, 1917.

An earthquake of unusual intensity was recorded here to-day and also at Sydney. The disturbance was located approximately in the Kermadec Islands, a small British archipelago off the east coast of Australia. (Associated Press.)

~~556.341~~ (776)

MINNESOTA'S EARTHQUAKE OF SEPTEMBER 3, 1917.

By Prof. C. J. Posey.

[Dated: Department of Geology, University of Minnesota, Minneapolis, Nov. 28, 1917.]

It is well known that earthquakes occur much more frequently in some parts of the world than in others. In some regions a shock must be rather severe in order to receive more than passing notice, while in others even a slight tremor arouses general interest, so infrequently are earthquakes experienced. It is to this latter class that the upper Mississippi valley belongs.

About 3:30 on the afternoon of September 3, 1917, a slight earthquake was felt in central Minnesota, which is of interest not so much on account of its severity, or lack of it, as of the fact of its occurrence. So far as the writer has been able to learn there are no written accounts of earthquakes within the limits of the State since its settlement. That they have occurred here we know from the testimony of old settlers. The Long Prairie Leader of September 6, 1917, quotes Hon. Wm. E. Lee, of that city, as saying that "the vicinity experienced a harder shock in 1860, one that would have done damage had the country been more thickly settled at that time." In a recent letter to Mr. Warren Upham, Mr. Ora J. Parker, of Le Sueur, writes of an earthquake there on a Sunday afternoon between 1865 and 1870, a shock that was generally talked about the next day. It is not likely that these gentlemen refer to the same disturbance, for the dates do not coincide, and the two localities referred to are so far apart that a quake severe enough to be felt at the two places would have been more generally remembered.

The shock of September 3, 1917, was most severe at Staples, northeastern Todd County; at Lincoln, some 15 miles to the southeast in Morrison County; and at Brainerd, about 30 miles to the east, in Crow Wing County. Along a line running north of east and slightly oblique to this east-west line, the disturbance was felt at places approximately 110 miles apart; and along a line connecting Brainerd and Minneapolis it was felt for a maximum distance of about 120 miles. The total area over which the shock was felt was probably not more than 10,000 square miles. The distance it was felt east of Brainerd was about the same as that west of Staples; but along the northwest-southeast line it was felt several times as far to the south of Brainerd as to the north, thus showing that the disturbance was damped more rapidly northward.

¹ Reported by the organization indicated and collected by the seismological station at Georgetown University, Washington, D. C.

An inspection of the accompanying table shows that but one shock is generally reported, though two places indicate two shocks and two others mention three. The places experiencing more than one shock are so scattered that there is no apparent reason why they should have had the extra numbers. The reported duration of the shocks varied from one second at Aldrich to 25 seconds at Motley, both places ranking high in intensity. Perhaps a fair average of the duration would be 10 seconds. Those places experiencing three shocks give a total duration of less than 10 seconds. The accompanying sounds are generally described as a rumbling noise, similar to that of an incoming train or heavily laden trucks.

TABLE 1.—Noninstrumental reports on the Staples earthquake.

(Adapted from the U. S. Weather Bureau seismological reports for Sept., 1917.)

Day.	Station.	Intensity Rossi- Forel.	Num- ber of shocks.	Dura- tion.	Sounds.	Remarks.
1917. Sept. 3, 3:30 p.m.	Aldrich.....	5	1	Secs. 1	Rumbling	
	Alexandria.....	3	1			Dishes and pans rattled.
	Brainerd.....	5-6	3	7	Rumbling	Bricks fell from chimneys.
	Crosby.....	4	1	5	Rumbling	
	Crow Wing.....	1	1		Rumbling	
	Eagle Bend.....	4-5	1	20	Rumbling	
	Fort Ripley.....	1	1		Rumbling	
	Henning.....	3-4			Faint	Dishes jarred.
	Grant.....	5	1	20	Rumbling	
	Gull Lake Dam.....	4-5	1	10	Rumbling	
	Jenkins.....	4-5	1			Shook buildings.
	Leader.....	5	1	5	Rumbling	Windows and stoves rattled.
	Lincoln.....	6	1		Rumbling	Plaster cracked; stove pipe thrown down.
	Little Falls.....			20	Rumbling	Dishes and stove lids rattled.
	Long Prairie.....	3	1		None	Caused some alarm windows rattled.
	McGregor.....	3	1	2	Rumbling	
	Merrifield.....	3	1	6	Rumbling	
	Milaca.....	3				Dishes rattled.
	Minneapolis.....	2-3	1	10	None	
	Motley.....	5	1	25	Rumbling	
	Onamia.....	3			Rumbling	
	Park Rapids.....	2	1			
	Parkers Prairie.....	5	1	20	Rumbling	
	Philbrook.....	5	2		Rumbling	
	Pierz.....	3	1		Rumbling	
	Pillager.....	5	2	20	Rumbling	
	Pine River Dam.....					
	Pequot.....	4-5	3	6	Rumbling	Goods shaken off shelf.
	Saint Cloud.....	2	1			
	Sauk Center.....	3	1	6		
	Staples.....	6	1	10-20	Rumbling	Walls cracked; cement floor cracked.
	Sylvan.....	5			Rumbling	
	Verndale.....		1	20	Rumbling	Rattled dishes and windows.
	Wadena.....				Rumbling	

Based on an adapted Rossi-Forel scale, the intensities were not above VI, only three places, Staples, Lincoln, and Brainerd, being of this higher number. The greater disturbances generally follow the Crow Wing-Mississippi valleys between Staples and Brainerd. From the non-instrumental data received, the accompanying figure showing the isoseismal lines of intensity III and above has been drawn.

As might be expected from an intensity of only VI, little damage was done. The wall on one side of a brick building in Staples was cracked, as was also the cement floor in the vault of the city clerk's office. The only damage mentioned from Brainerd was the dislodging of several courses of brick from a chimney there. A chimney was thrown down near Lincoln. In no case were windows reported broken.

The cause of the earthquake is obscure. The region is one of pre-Cambrian rocks that were much shattered before Cambrian times. The rocks show no evidence of recent faulting and, both because of the small area disturbed and the weakness of the rock, it is extremely unlikely that this recent disturbance was caused by faulting. The more plausible explanation is that there was a slight settling of the material of some of the filled-in preglacial valleys in that vicinity.

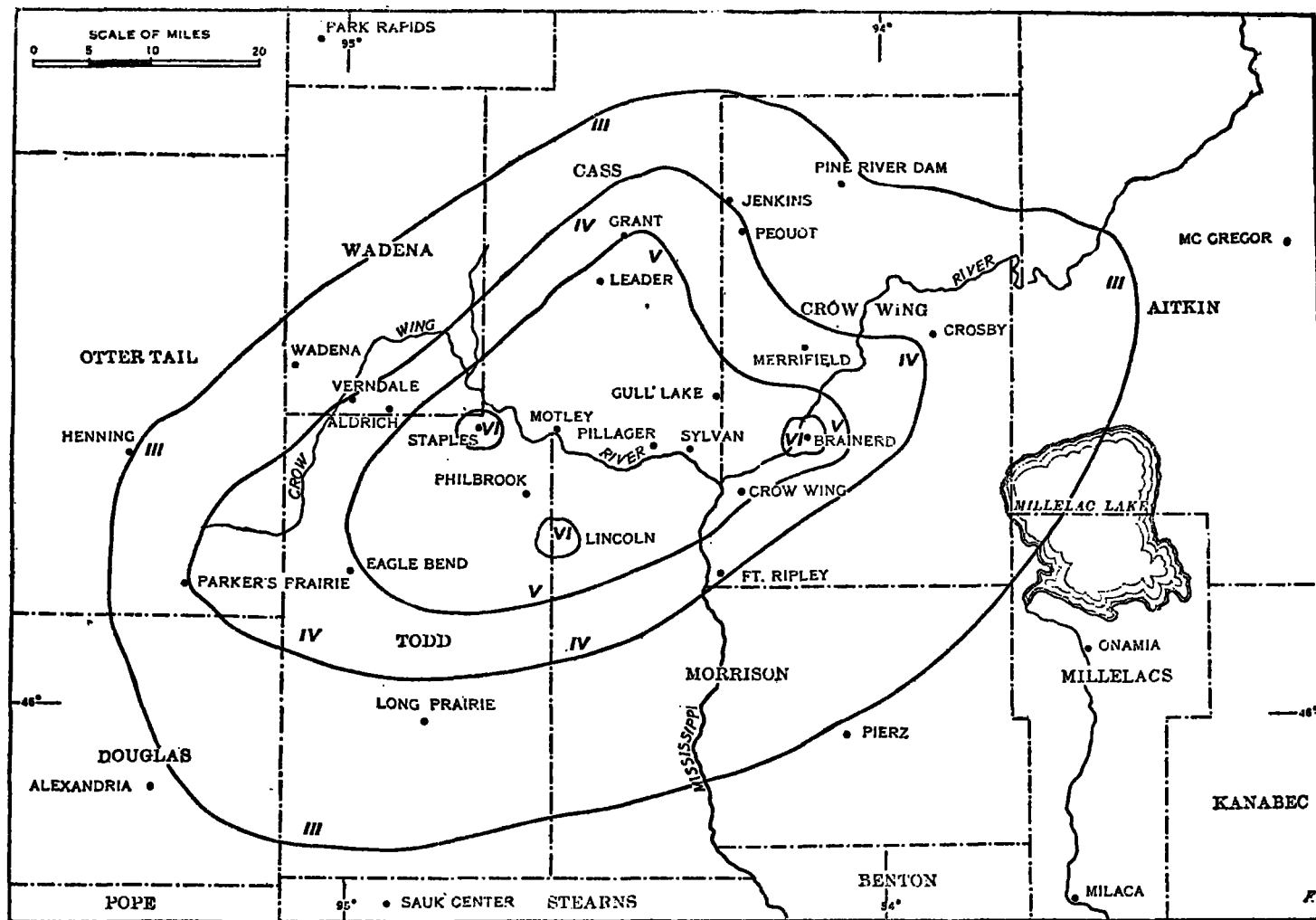


FIG. 1.—Isoseismals of Staples, Minn., earthquake, Sept. 3, 1917.